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ABSTRACT

Visual representations of the main ideas of information text (frames) help middle-grade students learn from reading. A study investigated frame development by middle-grade teachers. Twenty-seven teachers worked alone and collaboratively to frame experimental passages that had been selected from content area textbooks in social studies and science. Their conversations were also audiotaped. Results indicated that for each content area text, 75% of the frames used the same basic formats and represented the same major ideas from text. Frames varied considerably, however, in accuracy and completeness of representing subordinate concepts and in explicit use of text terms. Results also showed that collaboratively produced frames generally had higher degrees of completeness, accuracy, and explicitness than did frames produced by individual teachers. Analysis of the frames and the audiotaped conversations revealed the challenges of the framing process and the results of collaborative work. Suggestions for teachers on developing frames include: (1) think about text structure and frame formats when reading; (2) use ready-made frame formats or develop regular frame formats; (3) work with another person; (4) check text for accuracy and information; (5) be sensitive to problems with text; and (6) make frames simple and unified. (Eight figures of frames are included and 17 references are attached.) (PRA)

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CENTER FOR THE STUDY OF READING

Technical Report No. 542

MAKING FRAMES FOR LEARNING FROM INFORMATIONAL TEXT

James O. Armstrong
Bonnie B. Armbruster
University of Illinois at Urbana-Champaign

September 1991

University of Illinois at Urbana-Champaign
51 Gerty Drive
Champaign, Illinois 61820

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Abstract

Children in the middle grades often have difficulty learning from reading informational text. Recent research has shown improved learning by middle-grade students from instruction that included graphic representations of text structures. The purpose of this report is to assist teachers in preparing visual representations of the main ideas of informational text (frames) for the purpose of helping middle-grade students learn from reading. This report draws on material from a study investigating frame development by middle-grade teachers. Examples of teacher-made frames and audiotaped teacher talk are presented, and suggestions are made for teachers who want to develop frames for use with their students.

MAKING FRAMES FOR LEARNING FROM INFORMATIONAL TEXT

Children in the middle grades often have difficulty learning from reading informational text. This difficulty may result in part from a lack of sensitivity to the overall structure of informational text (McGee, 1982; Taylor, 1980; Taylor, 1986; Winograd, 1984). Research has shown that instruction that helps students identify and use the author's top-level structure can improve learning (Taylor, 1982; Taylor & Beach, 1984). The top-level structures of informational text can be grouped into three categories (Armbruster, 1985): Description (simple listing, definition with examples); comparison/contrast; and explanation (temporal sequence, cause-effect, problem-solution).

One way to help students identify and use informational text structure is through the use of graphic organizers, or visual representations of text structures. McGee and Richgels (1985) and Piccolo (1987) proposed graphic organizers that teachers might use to teach the common informational text structures. Several researchers have demonstrated improved learning by middle-grade students from instruction that included graphic organizers representing the key ideas and structural elements of informational text (Armbruster, Anderson, & Meyer, in press; Armbruster, Anderson, & Ostertag, 1987, 1989; Berkowitz, 1986; Boothby & Alvermann, 1984).

The studies by Armbruster and colleagues (Armbruster et al., 1987, 1989; Armbruster et al., in press) are part of a long-term collaborative project--the Framing Project--between a university research unit and a public school district in central Illinois. In the Framing Project, researchers and middle-grade teachers collaborate to produce instructional graphics called frames to represent the main concepts and their interrelationships found in regular classroom social studies textbooks. The use of frames in content area instruction is then experimentally tested. Although there are no set formats for frames, the three types of text structures are typically represented in the description, comparison/contrast, and explanation frame formats, which are shown with sample information in Figure 1.

[Insert Figure 1 about here.]

During the course of the project (Armbruster et al., in press), the teachers assumed increasing responsibility for producing the frames that they wished to use for instruction. They found (and those of us on the research team were reminded!) that producing frames for real textbooks is a difficult challenge. In making frames, the teachers and researchers wrestled with these issues: What is the really important text information that students should know and that a frame should represent? How much detail should be included in a frame? What is the best way to portray visually the main ideas and relationships?

At the conclusion of the study, we realized that we needed to know more about frame production in order to assist other teachers to develop and use frames. Therefore, we conducted a second study to investigate both the *process* and *products* of frame development. A brief description of that study follows (See Armstrong, Armbruster, & Anderson, 1991, for a full description).

A Study of Teacher-Made Frames

The subjects were 27 teachers involved in the Framing Project during the 1989-90 school year. Six were teachers who had some previous experience with framing, while 21 were new to the project and to framing. Twenty were teaching in the fourth grade, six in fifth grade, and one in third grade.

In an introductory session, teachers and researchers discussed sample texts and frames. Then, working alone, teachers read and framed two experimental passages that had been selected from content area textbooks in social studies (Parramore & D'Amelio, 1979) and science (Barman et al., 1989). Each passage, written for the fourth-grade level, was a complete lesson of about 500 words. The lesson topics were the drought in England and Wales in 1976 and cone-bearing plants. Next, teachers worked

collaboratively in pairs or larger groups and produced frames to represent the same text lessons that they had earlier framed individually. During collaborative sessions, teachers' talk was audiotaped.

All teacher-made frames and the transcripts of audiotaped sessions were analyzed according to methods described in detail in Armstrong et al. (1991). The major findings of the study were that for each content area text, three fourths of the frames used the same basic formats and represented the same major ideas from text. Frames varied considerably, however, in accuracy and completeness of representing subordinate concepts and in explicit use of text terms.

Another finding was that collaboratively produced frames generally had higher degrees of completeness, accuracy, and explicitness than did the frames produced by individual teachers. In 29 concept categories that were analyzed for completeness, explicitness, and accuracy, pair-produced frames improved upon individually made frames in 59% of the categories, and group-produced frames improved upon the individually produced frames in 43% of the categories.

The audiotaped collaborative sessions revealed that the teachers' concern for students' understanding greatly affected frame production. While making frames, many teachers considered how students of different grade levels and reading abilities might be affected by the amount of information in a frame or by the complexity of the frame's design. In addition, teachers with prior framing experience confirmed that framing at first had been very difficult for them, but that framing experience led to improved frames.

Next, we will discuss the production and features of the frames in the two content areas in some detail, including a description of specific teacher-made frames for both lessons. The frames and teacher talk reveal some of the challenges of the framing process, and they show some of the results of collaborative work.

Social Studies

Nearly 80% (27 of 35) of all the teacher-produced frames representing the social studies text used a ready-made frame for a problem-solution text structure (Figure 2). This format had been presented to all teachers (and had been used in the Framing Project). Like other explanation frames, this one has arrows to indicate conceptual relationships; that is, a *Problem* led to (or resulted in) *Action*, and *Action* caused (or enabled) *Results*. The frame slots below these labels are to be filled in with specific information from a text.

[Insert Figure 2 about here.]

Although most teachers who worked alone used an explanation frame, specific causal relationships were explicitly and accurately linked in only 33% (9 of 27) of the individually produced frames. Lack of prior framing experience among teachers might account for some of this problem, but the way that the text was written probably caused comprehension problems. In 12 consecutive sentences that describe specific problems and actions of the 1976 drought, only one of the causal relationships is explicitly signaled (with a conjuntion, *because*). Here is a portion of the text segment: "Without water, crops were lost. The price of vegetables rose. Trees began to die. Forest fires became a great danger" (Parramore & D'Amelio, 1979, pp. 123-124). Thus, to comprehend the connections between problems and their effects requires that the reader make a series of inferences. Through the teachers' collaborative work, however, these causal relationships were explicitly and accurately linked in 75% (6 of 8) of the frames made by teachers working together.

With this background, we will discuss the social studies frames produced by Teacher 1, who was new to framing, and by Teacher 2, who brought extensive framing experience to this study. In the frame of Teacher 1 (Figure 3), notice that specific problems of the drought conditions are placed opposite

corresponding solutions, such as (because) grass died, (farmers had to) feed hay to cows. This and other causal relationships, though, are not explicitly linked by arrows. A more problematic relationship concerns how "water gardens with bath water" was a response to the loss of crops. A lookback to the text reveals that the reuse of bath water had nothing to do with crop loss. The lower part of Figure 3 shows a separate frame that represents the overall lessons of the water crisis.

[Insert Figures 3-5 about here.]

The frame of Teacher 2 (Figure 4) has three sections for problems, actions, and results, with each of these categories accompanied by a summary statement. Although specific problems are linked by arrows to specific effects, the three major sections of this frame are not visually linked. Through collaborative talk, Teacher 2 realized that her frame was "too crowded" and that "it [information] really does need to be in a place where the students can see how it flows [from *Problem* to *Action* to *Results*]."

This realization is reflected in the collaborative frame (Figure 5) of Teachers 1 and 2, which shows more visual unity than did either of their individually made frames. In the upper part of the frame, arrows link problems to corresponding actions. (Note, however, that the inaccurate relationship between "Crops lost" and "water gardens with bath water," which appeared in Figure 3, persists in the collaborative frame.) The upper part of the frame is linked by a thick arrow to *Results*. Besides having unity, this frame uses concise, clear language to represent the text thesis development.

Science

Three fourths (27 of 36) of the teacher-made frames in science represented the two sections of the text lesson with explanation and description formats. In addition, nine superordinate concepts in the text, such as conifer life cycle, kinds of conifers, conifer size, conifer shape, and needles, were represented in 81% (29 of 36) of all the conifer frames.

Like the social studies text, the science text presented difficulties of interpretation. For example, the text mentions seven features of conifer needles, but does not explicitly group them according to length (long or short), shape (round, flat, or several sided), and growth pattern (singly or in bunches). Of 24 individually made frames that included needle features, 14 (53%) had inaccurate information or left out one or more features.

Turning to the specific frames of Teachers 3 and 4, who were both new to framing, notice that the frame of Teacher 3 (Figure 6) uses *Cone-Bearing Plants*, the lesson title, as a superordinate category label. The two major text sections ("Life Cycle of a Conifer" and "Kinds of Conifers") are represented in table and chain formats. In general, the frame clearly and concisely represents several pages of text. However, the definition of *cone-bearing plants* should read "produce seeds *inside* cones," not "produce seeds *called* cones." This confusion is reflected in the life cycle chain, where key information is omitted (What takes a year to develop?). Also, in the table, *needles* is an incomplete category that is not divided accurately according to length.

[Insert Figures 6-8 about here.]

The frame of Teacher 4 (Figure 7) uses a branching tree format with the chain headed by *Life Cycle* embedded within a description frame. The arrows indicate process under *Life Cycle* but are used with simple lists under *Characteristics* and *Types*. Inconsistent use of arrows could cause reader confusion. Under *Characteristics*, conifers are accurately defined (and step 3 of the life cycle makes explicit how seeds are produced). In the category of *needlelike leaves*, further divisions by length and shape are not shown, and *several sides* is not included.

The collaborative frame of Teachers 3 and 4 (Figure 8) seems to resemble Teacher 3's frame (Figure 6), which had one frame with two parts. In contrast, Figure 8 shows two frames that are neither visually nor conceptually linked by a superordinate category. Teacher 3 explained why she preferred separate frames for her third-grade class of "slow learners": "The kids will understand and not have too many ideas to get at once." Presenting information in manageable amounts is a good idea, but teachers may need to show students how the separate frames correspond to the whole lesson.

Figure 8 shows evidence of this pair's work that improved somewhat upon the individually made frames. In the table of characteristics, *needles* includes all seven features and is divided according to length, shape, and growth pattern. Note, however, that *flat*, *rounded*, and *several sides* appear in two slots. Another strong point is that *Life Cycle* is virtually complete in six numbered steps. However, essential information about conifers producing seeds inside cones has not been included in this frame. A lookback to the text and brief discussion might have cleared up the confusion concerning seeds and cones.

Suggestions for Framing

The following suggestions are based on the comments of Framing Project teachers and on our analysis of teacher-made frames. Because framing is a complex process, suggestions should be used flexibly in response to variations in teachers' use of text, students' need for assistance, text difficulty, and purposes for reading. These variations inherent in the framing process have led us to make an assumption about the products of frame development: For a given segment of text, there is no single "best frame." In making any frame, however, we strive for a clear and accurate representation of the text content and structure.

1. As you read, think about text structure and frame formats. Several returning project members stated that as they read student text, they keep in mind the possibility of framing it. They notice how the text is organized and how the authors sometimes use words and phrases to signal text structure.

Several teachers new to the project engaged in the following dialogue, about how they started their frames:

> *Teacher A*: Not ever having done a frame before, I was sort of nervous, thinking how can I do this? So instead of immediately thinking of what frame to use, I read and underlined the text, and then I took notes . . . . Looking at the notes, I was able to see how I felt the structure of the article went. Then I could pick out my frame.
>
> *Teacher B*: I thought just the opposite. I thought this was so well organized as an article that you could just go through and pull the points right out of the article.
>
> *Teacher C*: What I did was to look through the sample frames, and I found a frame that I thought fit perfectly and so I was able to slap the information right into the frame.

2. If possible, use ready-made frame formats or develop regular frame formats. Repeated use of frame formats can help students to understand how similar text structures are used with different topics. The following comment was made by a teacher who had repeatedly used the ready-made format in Figure 2: "I used to think if I didn't change it [frame format], they [students] would get bored. But they don't. In fact, they really do a lot better when they know what to expect."

3. Work with another person. Start by framing independently. Then, by examining both frames and reviewing the text, you can work to produce a collaborative frame that reflects the strongest features of

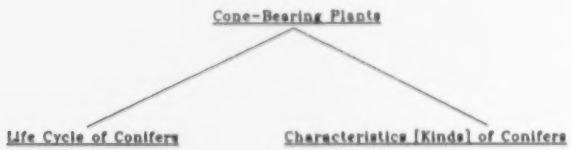
each person's frame. (If you and a colleague share an interest in framing but not a common text, perhaps you can read segments of each other's text and react to each other's frames.)

4. Check text for accuracy of information in frame. As a frame is drafted and revised, text lookbacks are essential to ensure that the frame continues to reflect the content of the text. Extra concern for accuracy is usually necessary when you are making explicit in a frame a conceptual relationship that is only implied in the text. This process might involve anything from inferring causal relationships between events to supplying names for categories or groups.

5. As you frame, be sensitive to problems with text. Some texts place heavy demands on readers by requiring many or complex inferences or by assuming an advanced level of topic background knowledge. As you're building a frame, try to be aware of a lack of clarity or sources of confusion in the text. Later, point out to students and discuss the discrepancies between the vague or implicit text and the explicit frame. You could also model for students or have them explain how you were able to go from a poor text to an explicit frame. What inferences were made, and how were they made? Following the discussion, you might even have students rewrite small segments of text. This kind of attention to challenging parts of the text can help students develop skill in making inferences and can encourage them to be active in making meaning from text.

6. Make frames simple and unified. Frames are intended to assist students to comprehend the relationships between main ideas and *essential* details of a passage. Frames with too much detail may confuse students about what information is really important. One teacher commented from her experience: "If you get too much detail in a frame, kids will look at it and quit."

One way to unify disunified frames can be illustrated with a reference to Figure 8. The separate frames are now interrelated with the following supplemental three-slot frame:



This frame could be used during class to remind students how the detailed frames in Figure 8 correspond to the whole text lesson.

7. Consider how much information to fill in and how much to leave for the students to do. Completely filled-in frames, such as those that appear in this article, would probably not be used with students. In 12 of 17 collaborative sessions, teachers spontaneously stated that students must be actively involved in filling in frames. Teachers with framing experience had introduced frames to their regular students by preparing a frame with blank slots (of roughly uniform size). Text information for filling the slots was listed on separate paper or the chalkboard. Together, teacher and students worked out where the information fit in the frame. After practice, students worked with just the text to find the information they needed to complete a frame that had only the principal slots filled in by the teacher.

Conclusion

Taken together, these suggestions reflect the complexity of the framing process. Clear and accurate representation of informational text requires insight and care. Fortunately, these qualities can be developed through thoughtful work. Working in pairs can also significantly improve the frames previously produced alone. Practice is essential for teachers in learning to make frames successfully and for students in learning to use them well. The effort in learning to work with frames can lead both teachers and students to increased learning from the texts that they share.

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Author Note

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James O. Armstrong
Bonnie B. Armbruster

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Figure 1 Text Structures (and Frame Formats)
after Armbruster (1985)

1. Description (branching tree, wheel, or table)

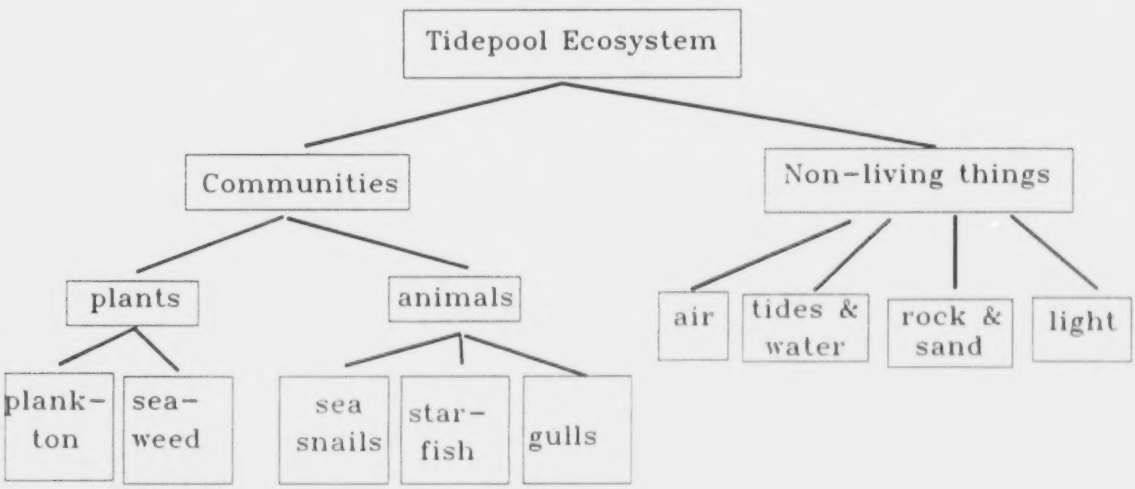


Figure 1 (continued)

THE NETHERLANDS

Land	Water	Agriculture	Commerce & Industry
sand dunes lowlands	North Sea canal system 3 large rivers	garden plants dairy products	international trade oil refineries natural gas

2. Comparison/contrast (matrix)

	Nile River	Amazon River
Location	Africa; flows through desert	South America; flows through rain forest
Length	the world's longest river	the world's second longest river
Uses	water for crops; water power for electricity	materials

3. Explanation (chain)

Plants in Pond Succession

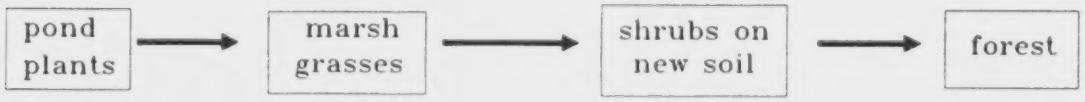
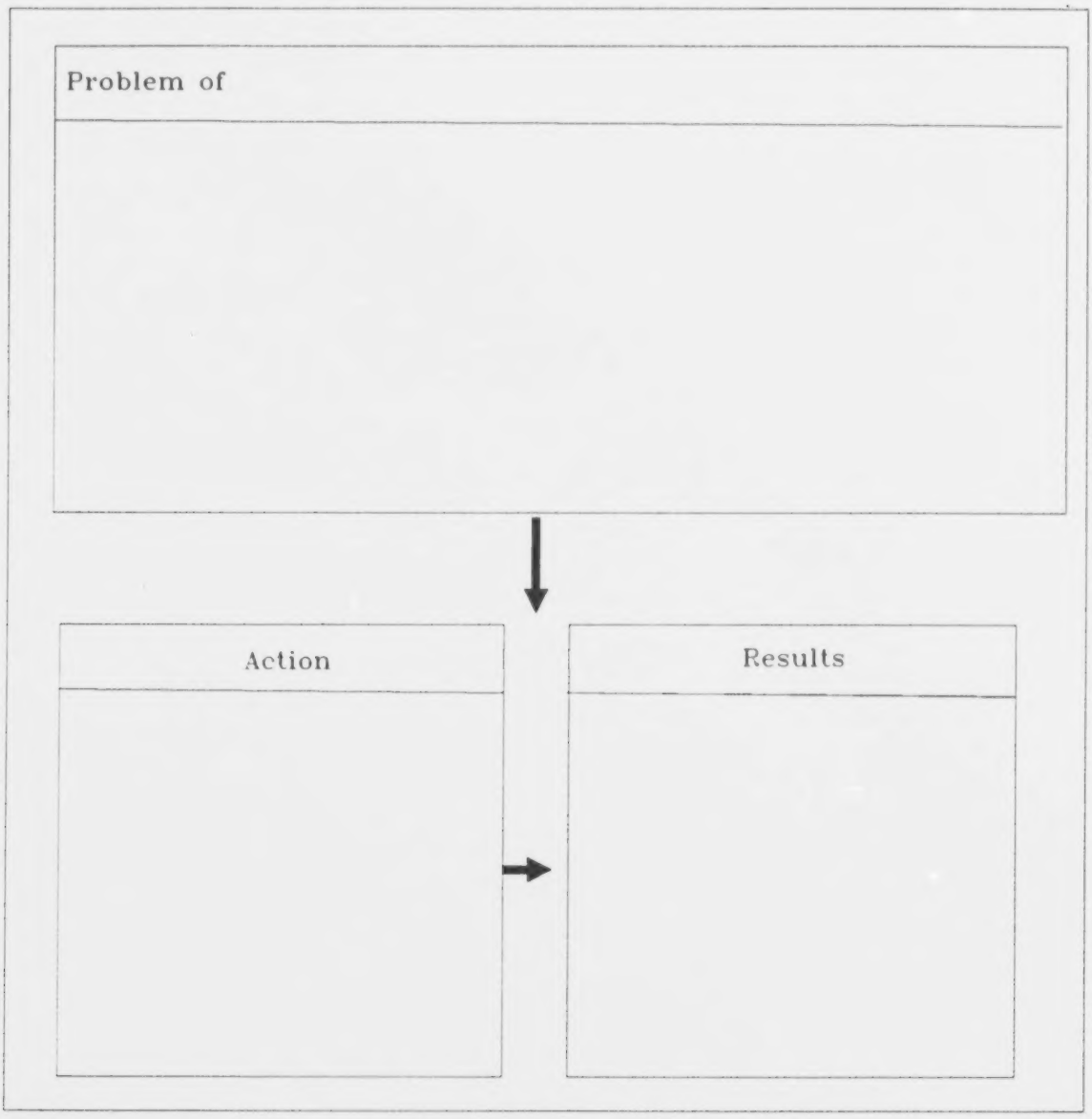


Figure 2

Problem–Solution Text Structure: Frame and Definition



Problem = something bad; a situation that people would like to change

Action = what people do to *try* to solve the problem

Results = what happens as a result of the action; the effect or outcome of trying to solve the problem

Figure 3 Frame of Teacher 1: Social Studies

Problems	Solutions
Grass died	Feed hay to cows
No milk from cows	
Crops lost	Prices rise water gardens with bath water
Trees die	
Forest Fires	Fire fighters stand guard
Rats and insects foul water	People stay away
Reservoirs dry up	People conserve water • Take showers • Use bathwater twice • Carry water by hand • Shut off water

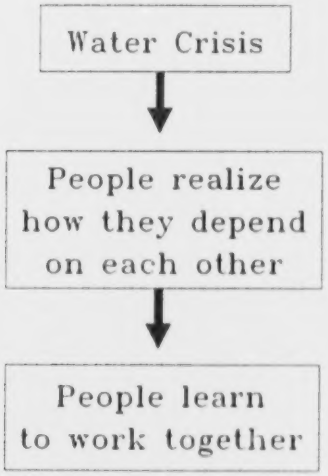


Figure 4 Frame of Teacher 2: Social Studies

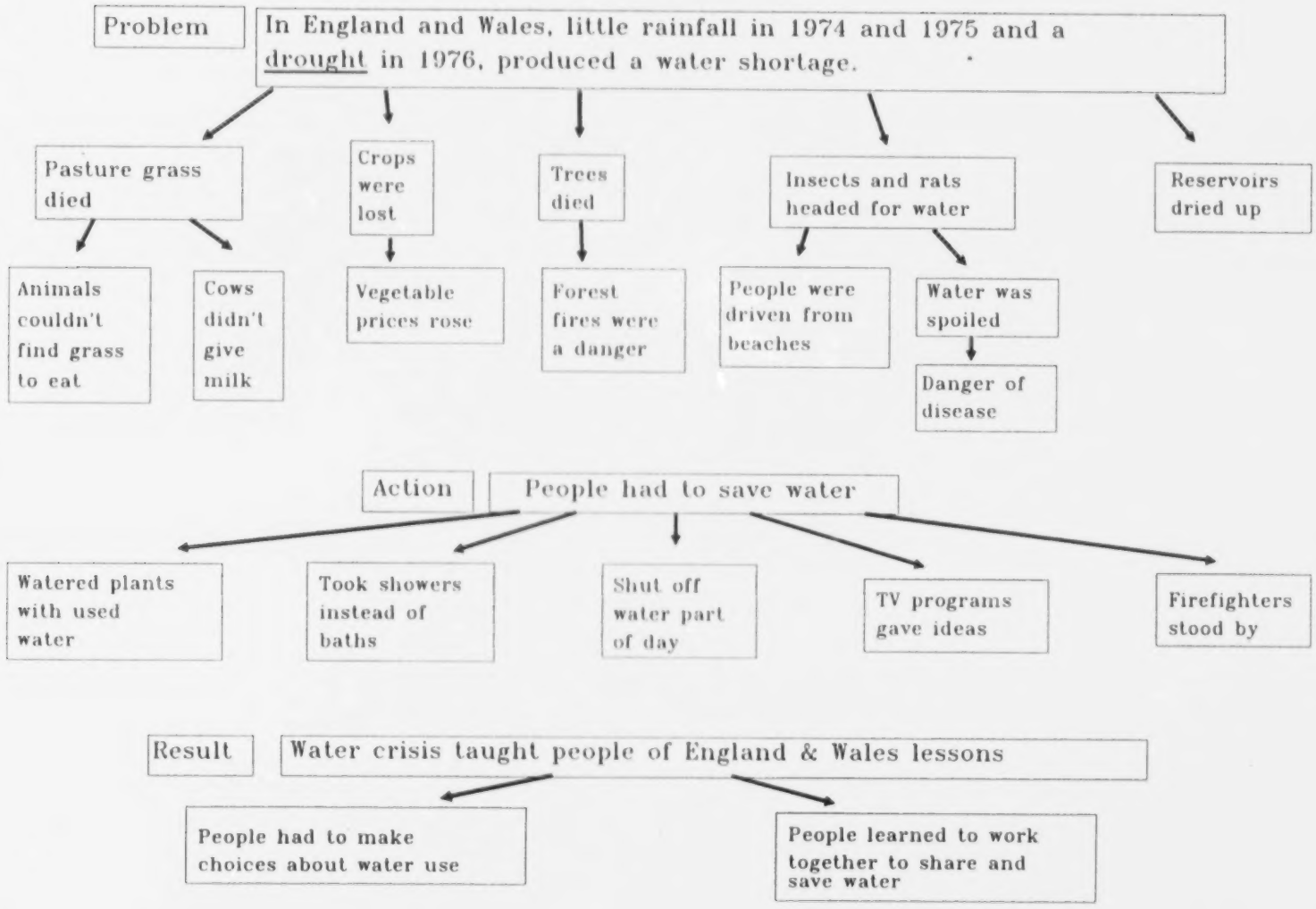

Problem
In England and Wales, little rainfall in 1974 and 1975 and a drought in 1976, produced a water shortage.
Pasture grass died
Animals couldn't find grass to eat
Cows didn't give milk
Crops were lost
Vegetable prices rose
Trees died
Forest fires were a danger
Insects and rats headed for water
People were driven from beaches
Water was spoiled
Danger of disease
Reservoirs dried up
Action
People had to save water
Watered plants with used water
Took showers instead of baths
Shut off water part of day
TV programs gave ideas
Firefighters stood by
Result
Water crisis taught people of England & Wales lessons
People had to make choices about water use
People learned to work together to share and save water

Figure 5 Collaborative Frame: Social Studies

"England and Wales in 1976"

Problems	Actions
Grass died →	Feed hay to cows
No milk from cows	
Crops lost →	Prices rise water gardens with bath water
Trees die	
Forest Fires →	Fire fighters stand guard
Rats and insects foul water →	People stay away
Reservoirs dry up →	People conserve water • Take showers • Use bathwater twice • Carry Water by hand • Shut off water

↓

Results	
Water crisis taught people lessons	
People had to make choices about water use	People learned to work together and to depend on each other to save water

Figure 6 Frame of Teacher 3: Science

Cone-Bearing Plants
(plants produce seeds called cones)

Kinds of Conifers

Shape	Round Shape	Triangle Shape	No Particular Shape	
Needles	Short	Long	needles with several different sides	grow all year long
Size	Tall Trees	Sequoia Trees Redwood Trees Pine Trees Cedar Trees	small shrubs	

Life Cycle of a Conifer

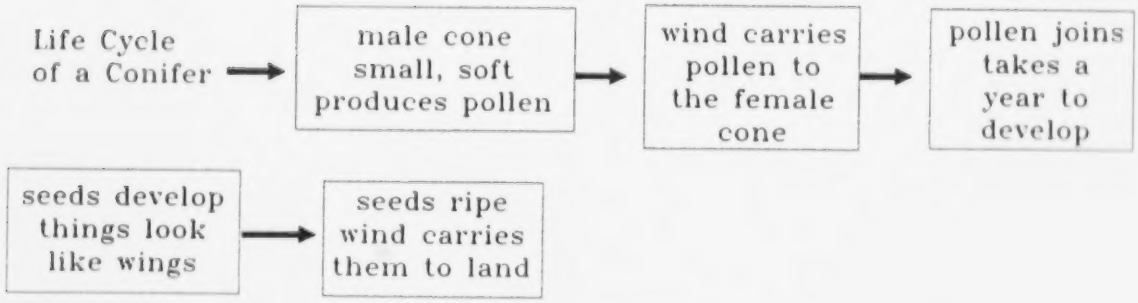

Life Cycle of a Conifer
male cone small, soft produces pollen
wind carries pollen to the female cone
pollen joins takes a year to develop
seeds develop things look like wings
seeds ripe wind carries them to land

Figure 7 Frame of Teacher 4: Science

Conifers
Characteristics
Life Cycle
Types
plants that produce seeds in cones (pine cones) (male & female)
some conifers can grow high as a 30-story building
can be shrubs
round or triangle shape
needlelike leaves (short, long, flat, round).
needles may grow singly or in bunches
1. Male cone produces pollen
2. The wind carries pollen through the air.
3. Some pollen is carried to female cones, it joins with the eggs to form seeds inside the cones
4. When the seeds are ripe, the cones open and release the seeds.
5. If the seeds land in a good place, new trees begin to grow
Blue Spruce
White Pine (Pine Trees)
Atlantic White Cedar (Cedar trees)

Figure 8

Collaborative Frame: Science

Characteristics of Conifers

Shape	Round	Triangle	No particular shape		
Needles	short or long	flat or rounded	several different sides	grow in singles or bunches	grow all year long
Size	Tall Trees: Redwood Sequoia tree Pine Trees Cedar Trees		Small shrubs		

Life Cycle of the Conifers

1 Male cone small, soft produces pollen →

2 Wind carries to the female cone →

3 Pollen joins with female cone, and it takes a year to develop. →

4 Seeds develop things that look like wings →

5 When seeds are ripe, the wind carries them to land →

6 If the seed lands in a good place, new trees begin to grow.